AMENDMENTS TO THE CLAIMS

1. (Currently amended) A semiconductor source of emission electrons comprising:

   a) a target comprising a wide bandgap semiconductor, said target having a target thickness between an illumination surface and an emission surface of said target; and

   b) a means for producing and directing a beam of seed electrons at said illumination surface;

   c) a means for controlling an energy of said seed electrons such that said seed electrons generate electron-hole pairs in said target and a fraction of said electron-hole pairs supply said emission electrons; and

   wherein said target thickness and the energy of said seed electrons are optimized such that said seed electrons do not fully penetrate said target and said emission electrons are substantially thermalized at said emission surface such that an energy spread of said emission electrons at said emission surface is less than approximately 1 eV.

2. (Original) The semiconductor source of claim 1, wherein said wide bandgap semiconductor has a negative electron affinity at said emission surface.

3. (Original) The semiconductor source of claim 2, wherein said side bandgap semiconductor comprises a material selected from the group consisting of diamond, AlN, BN, $Ga_{1-y}Al_yN$ and $(AlN)_x(SiC)_{1-x}$, wherein $0 \leq y \leq 1$ and $0.2 \leq x \leq 1$.

4. (Original) The semiconductor source of claim 3, wherein said wide bandgap semiconductor is diamond and said emission surface is hydrogen-terminated for generating said negative electron affinity.

5. (Original) The semiconductor source of claim 2, wherein said wide bandgap semiconductor comprises a means for generating said negative electron affinity at said emission surface.

6. (Original) The semiconductor source of claim 5, wherein said means for generating is a material coating.

7. (Previously presented) The semiconductor source of claim 6, wherein said wide bandgap semiconductor is diamond and said material coating comprising Cs and O.

8. (Original) The semiconductor source of claim 1, further comprising a means for drawing said emission electrons from within said target to said emission surface.

9. (Original) The semiconductor source of claim 8, wherein said means for drawing comprises a built-in electric field induced by a bandgap ramp.

10. (Original) The semiconductor source of claim 8, wherein said means for drawing comprises an external applied electric field penetrating said target.

11. (Original) The semiconductor source of claim 1, further comprising a means for producing and directing a beam of said emission electrons.

12. (Original) The semiconductor source of claim 11, wherein said means for producing and directing comprises an external applied electric field.

13. (Original) The semiconductor source of claim 11, wherein said means for producing and directing comprises an external applied magnetic field.

14. (Canceled)

15. (Currently amended) The semiconductor source of claim 1 ~~14~~, wherein said energy spread is less than 0.1 eV.

16. (Original) The semiconductor source of claim 1, wherein said means for producing and directing said beam of seed electrons comprises a photocathode and a light source for photoinduced generation of said seed electrons from said photocathode.

17. (Original) The semiconductor source of claim 16, wherein said photocathode comprises a negative electron affinity photocathode.

18. (Original) The semiconductor source of claim 16, wherein said means for producing and directing said beam of seed electrons comprises a voltage source for applying an electric field to said seed electrons.

19. (Original) The semiconductor source of claim 16, wherein said means for producing and directing said beam of seed electrons comprises a unit for applying a magnetic field to said seed electrons.

20. (Original) The semiconductor source of claim 1, wherein said means for producing and directing said beam of seed electrons comprises a source selected from the group consisting of field emission source, thermionic source and thermal field emission source.

21. (Original) The semiconductor source of claim 20, wherein said means for producing and directing said beam of seed electrons comprises a voltage source for applying an electric field to said seed electrons.

22. (Original) The semiconductor source of claim 20, wherein said means for producing and directing said beam of seed electrons comprises a unit for applying a magnetic field to said seed electrons.

23. (Currently amended) A method for obtaining emission electrons from a target comprising a wide bandgap semiconductor, said method comprising ~~the following steps~~:

a) defining a target thickness between an illumination surface and an emission surface of said target;

b) generating a beam of seed electrons;

c) directing said beam of seed electrons at said illumination surface;

d) controlling an energy of said seed electrons such that said seed electrons generate electron-hole pairs in said target and a fraction of said electron-hole pairs supply said emission electrons; and

wherein said target thickness and said energy of said seed electrons are optimized such that said emission electrons are substantially thermalized at said emission surface such that an energy spread of said emission electrons at said emission surface is less than approximately 1 eV.

24. (Original) The method of claim 23, further comprising producing and directing a beam of said emission electrons to an application unit.

25. (Original) The method of claim 24, wherein said application unit is a scanning electron microscope for employing said beam of said emission electrons for scanning electron microscopy.

26. (Original) The method of claim 24, wherein said application unit is a display for employing said beam of emission electrons in an image display.

27. (Original) The method of claim 24, wherein said application unit is a lithographic device employing said beam of emission electrons for lithography.

Detailed action --- claim rejections under 35 USC 102

Claims 1-13, 23 and 24 stand rejected under 35 USC 102(b) as anticipated by US 6,060,839 (hereinafter Sverdrup).

Independent claims 1 and 23 are currently amended to recite a limitation to an energy spread of emission electrons of less than about 1 eV, which is the further limitation of claim 14 as originally filed. No new matter or new issue is thereby introduced.

Claims 1 and 23 as amended are neither taught nor suggested by Sverdrup. In particular, Sverdrup has no teaching at all regarding the energy spread of the emission electrons. Examiner draws attention to lines 39-43 of column 3 of Sverdrup in connection with the present rejection of claim 14. However, this section of Sverdrup does not relate to the energy spread of emission electrons. Instead, it is a discussion of the effect of varying the primary (or seed) electron energy on emission electron current density. The pertinent claim limitation relates to secondary (i.e. emission) electrons instead of primary electrons, and also relates to the energy spread as opposed to the (average) energy. Thus the indicated section of Sverdrup is simply irrelevant to the claim limitation to "an energy spread of said emission electrons at said emission surface is less than approximately 1 eV".

Examiner's comments in the office action appear to indicate that the emission electron current density is being identified with the energy spread of emission electrons. These two concepts are clearly distinct. In particular, knowledge of the emission electron current density gives no information on the emission electron energy spread, since the same current density J can be provided by a set of emission electrons having a large energy spread as by a set of emission electrons having a small energy spread. Thus, given a emission electron current density J, there is no way to deduce the energy spread of the emission electrons from J. Another significant distinction is that an energy (or energy spread) does not have the same physical unit dimensions as a current density.

Claims 2-13 depend from claim 1, and claim 24 depends from claim 23. Therefore, the above amendments and arguments in connection with claims 1 and 23 are also responsive to this rejection of claims 2-13 and 24.

Detailed action --- claim rejections under 35 USC 103

Claims 14-15 stand rejected under 35 USC 103(a) as unpatentable over Sverdrup.

Claim 14 is canceled. Claim 15 is amended to depend from claim 1. Therefore, the above amendments and arguments in connection with claims 1 and 23 are also responsive to this rejection of claim 15.

Detailed action --- claim rejections under 35 USC 103

Claims 16-19 stand rejected under 35 USC 103(a) as unpatentable over Sverdrup in view of US 5,684,360 (hereinafter Baum).

Claims 16-19 depend from claim 1. Therefore, the above amendments and arguments in connection with claims 1 and 23 are also responsive to this rejection of claims 16-19.

Detailed action --- claim rejections under 35 USC 103

Claims 20-22 stand rejected under 35 USC 103(a) as unpatentable over Sverdrup in view of US 5,592,053 (hereinafter Fox).

Claims 20-22 depend from claim 1. Therefore, the above amendments and arguments in connection with claims 1 and 23 are also responsive to this rejection of claims 20-22.